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Status Report

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Vacuum Ultraviolet Spectra of Atoms and Light Molecules

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Research carried out under NASA Order No. R-64, Amend. #2
dated December 18, 1964; NBS Project No. 2210461

Project Leader: Dr. A. M. Bass

Reporting Period: November 1, 1964 - February 28, 1965

1. Publications:

"Application of Cooled IR Detector in an Optical System",
by S. Abramowitz, A. M. Bass and A. E. Ledford, Jr.,
appeared in Applied Optics 4, 255 (1965).

"Matrix Isolation Study of the Reaction of F-Atoms with
CO; Infrared and Ultraviolet Spectrum of the Free
Radical FCO", by D. Milligan, M. Jacox, A. M. Bass,
J. Comeford, and D. E. Mann, (NBS Report 8589, Nov. 13,
1964) has been accepted for publication in the Journal
of Chemical Physics.

"Vibrational Fundamentals of CF_3N_2 from the Ultraviolet
Absorption Spectrum", by J. D. Simmons, I. R. Bartky,
and A. M. Bass, (NBS Report 8625, February 1, 1965)
has been submitted to the Journal of Molecular Spectros-
copy.

2. Work has continued on the investigation of the ultraviolet absorption spectra of low temperature matrix-stabilized radicals produced by ultraviolet photolysis. This work is carried out in collaboration with Drs. D. Milligan and M. Jacox who have been studying the infrared spectra of these species. In this connection, the radical NCN, produced by the photolysis of cyanogen azide (NCN_3) has been observed. A report is being prepared describing the preparation of this radical, and its spectroscopic properties.

Preparations are being made to extend our observations further into the vacuum ultraviolet region in order to search for the spectra of matrix-isolated CH_2 and CH_3 radicals. The properties of these species, and of the starting compounds which must be photolyzed in order to produce these species, require modification of our system to permit photolysis by vacuum UV radiation. The cryostat which we are using is being adapted to this requirement. In addition, a more

intense radiation source for absorption spectra, which has been developed by another group in the Heat Division at NBS, is being studied for its application to the vacuum UV region. These modifications will take some time, but when completed should permit studies to be made of these radicals (CH_2 and CH_3) which are of particular interest in astrophysical environments.

3. Preparations are being made to receive and install a new 21-foot focal length high-resolution vacuum spectrograph which will substantially increase the experimental capabilities of our laboratory in the vacuum UV region. The instrument will be delivered and installed by June 1, 1965.
4. In the infrared, progress has been very limited on the study of the spectra of gas phase atomic flame reactions. The absorption and emission intensities have been too weak to observe in our system, as presently constituted. The application of multiple reflection techniques should help in this regard. Work on this aspect of our program has been discontinued for the present because of the termination of the limited appointment of the senior investigator (Dr. S. Abramowitz).